Innovations in the Transmission System

as a response to challenges related to the „Energiewende“

Development of Transmission Grids in the Context of the „Energiewende“
Berlin, 21.11.2017
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Three exemplary Innovations

1. WindNODE Flexibility Platform
2. International Grid Control Cooperation
3. Innovations in System Operation
WindNODE Flexibility Platform
Grid Congestion and Redispatch

Grid Congestion

Reduce PP output

Grid congestion

Increase PP output

Source: Scenario calculation IAEW, RWTH Aachen 2013

Redispatch

Power Plants relevant for Redispatch
→ Grid Reserve
→ PP not allowed to be taken from grid

Wind feed-in
Redispatch
RES Curtailment

Wind, Redispatch, Curtailment in MW

0 5.000 10.000 15.000 20.000 25.000 30.000 35.000

2015
Distinction of congestion management measures in Germany: Redispatch and RES curtailment

**Redispatch**
- Legal basis: § 13 Abs. 1 EnWG
- Units > 10MW are obliged to report their redispatch potential
- Flexibility request as a result of an optimization process
- Energetic and financial compensation of balancing groups

**RES-curtailment (Einspeisemanagement)**
- Legal basis: § 13 Abs. 2 EnWG
- Demand for reduction estimated for each node - Reductions of feed-in executed by DSOs
- No energetic or financial compensation of balancing groups
- Uncertainty about actual effect
- Balancing group deviations compensated by balancing power
In order to reduce RES curtailment additional flexibility sources will be incorporated in the redispatch process. Therefore new processes and communication structures (between grid operators and between flexibility provider and grid operator) are needed.

→ WindNODE Flexibility Platform
International Grid Control Cooperation
Grid Control Cooperation – Avoiding Counteractive Balancing

- **National GCC (Module 1-4)**
- **IGCC (Module 1 Imbalance Netting)**

**Module 1 - IGCC:**
Avoid Counteractivation

**Module 2:**
Common Dimensioning

**Module 3:**
Common Procurement of capacity

**Module 4 – National GCC:**
Activation based on common Merit Order List
Counteractivation of aFRR

There are time periods when the aFRR-demand of one LFC Area is positive (power deficit) while the demand of another LFC Area is negative (excess of power). Without cooperation, counteracting aFRR is activated.
Imbalance Netting in the IGCC

The IGCC aims at the reduction of this counteractivation by netting of aFRR demands in real-time, considering the relevant transmission limits.

- Power deficit: 100 MW
- aFRR activation: 50 MW

- Power excess: 50 MW
- aFRR activation: 0 MW
50Hertz’ achievements in integrating balancing markets on a cross-border scale

**International Grid Control Cooperation** (since 2012)

- Eight countries
- Cooperation started in 2011
- Main feature: Imbalance netting
- >300 Mil. EUR saved since 2011

**Frequency Control Reserve (FCR) cooperation**

- Six countries
- Cooperation started in 2012
- Main features: Common procurement

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Future Innovations in System Operation
Background:

- Increase of RES in the power system leads to increasing transmission task
- Therefore the grids have to be extended
- At the same time an optimised use of the infrastructure shall be assured without decreasing today’s level of security of supply

Goal: Development and testing of innovative system operation concepts, technologies and strategies
Components of Innovative System Operation

- EPC: Emergency Power Control
- UPFC: Unified Power Flow Controller
- TCSC: Thyristor Controlled Series Capacitor

Horizontal and vertical adjustment of flows in normal as well as fault operation and alert state